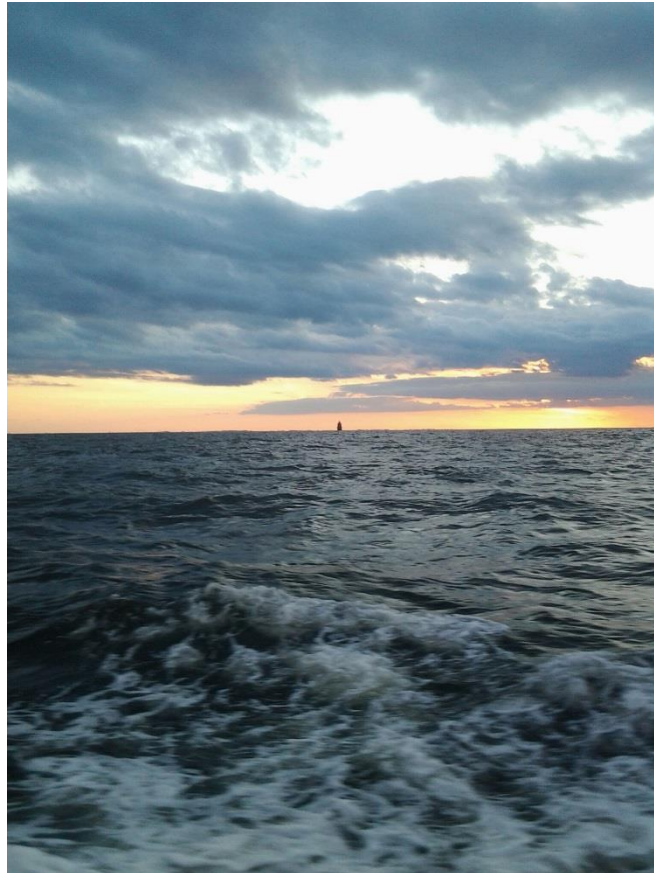


# Delaware River Basin Commission

## Surface Water Sampling in Delaware Estuary for Perfluorinated Compounds (PFCs)

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*Senior Environmental Toxicologist*

**Toxics Advisory Committee**  
*January 6, 2016*



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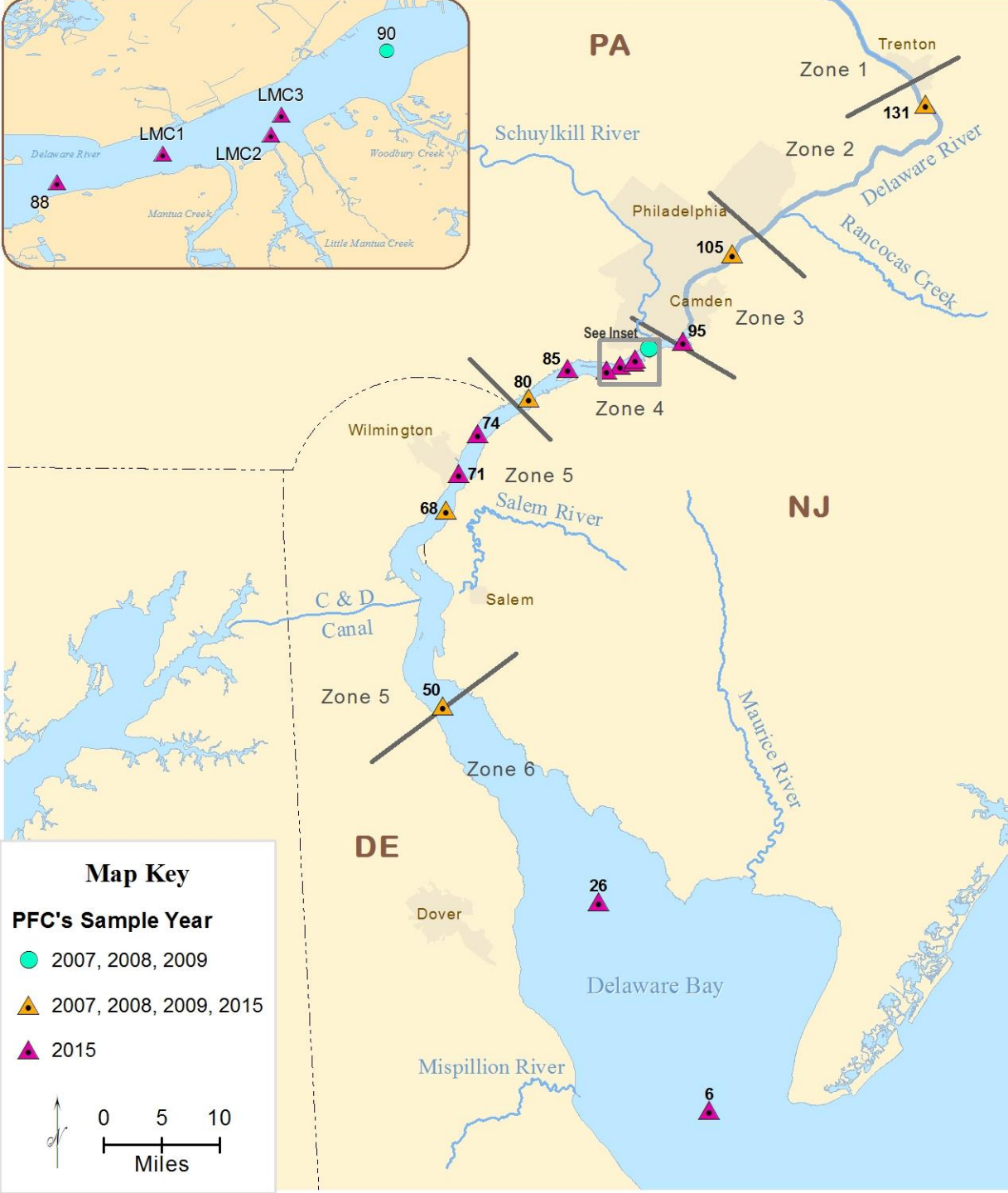
# Outline

- Introduction
- PFCs in surface water
  - Compare individual PFC at 6 sites (RM 50 to RM 131) sampled 2007, 2008, 2009 and 2015
  - Compare all PFCs at 15 sites (RM 6 to RM 131) sampled in 2015
  - Compare max 2015 PFC conc. to available water quality assessment values
  - Compare max 2015 PFC conc. to other surface water occurrence data
- Next Steps

# Intro to PFCs

- \* Properties
- \* Uses
- \* Sources
- \* Stewardship
- \* Alternatives
- \* Discharges
- \* Persistence
- \* Toxicity
- \* Bioaccumulation
- \* Sinks



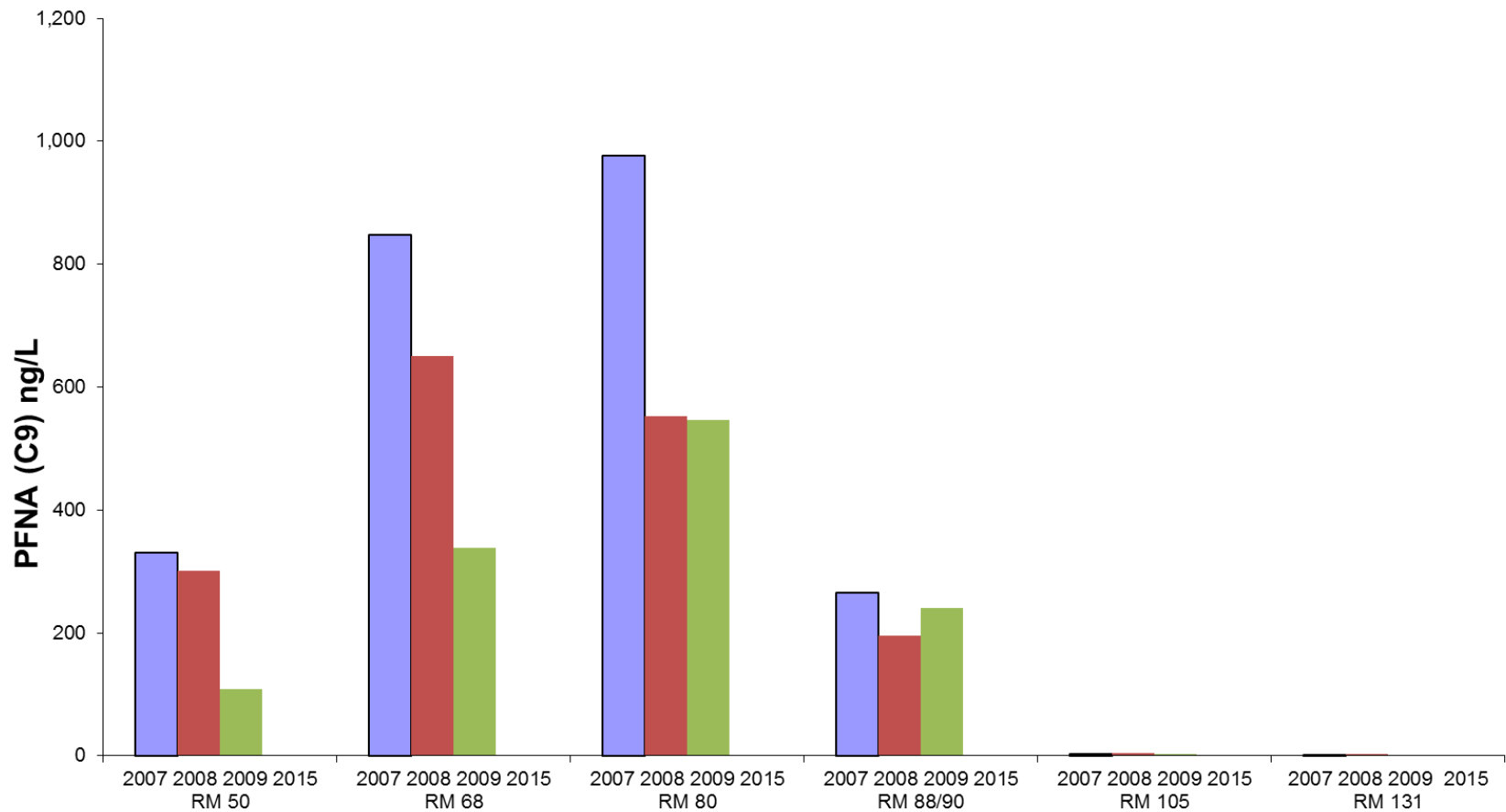


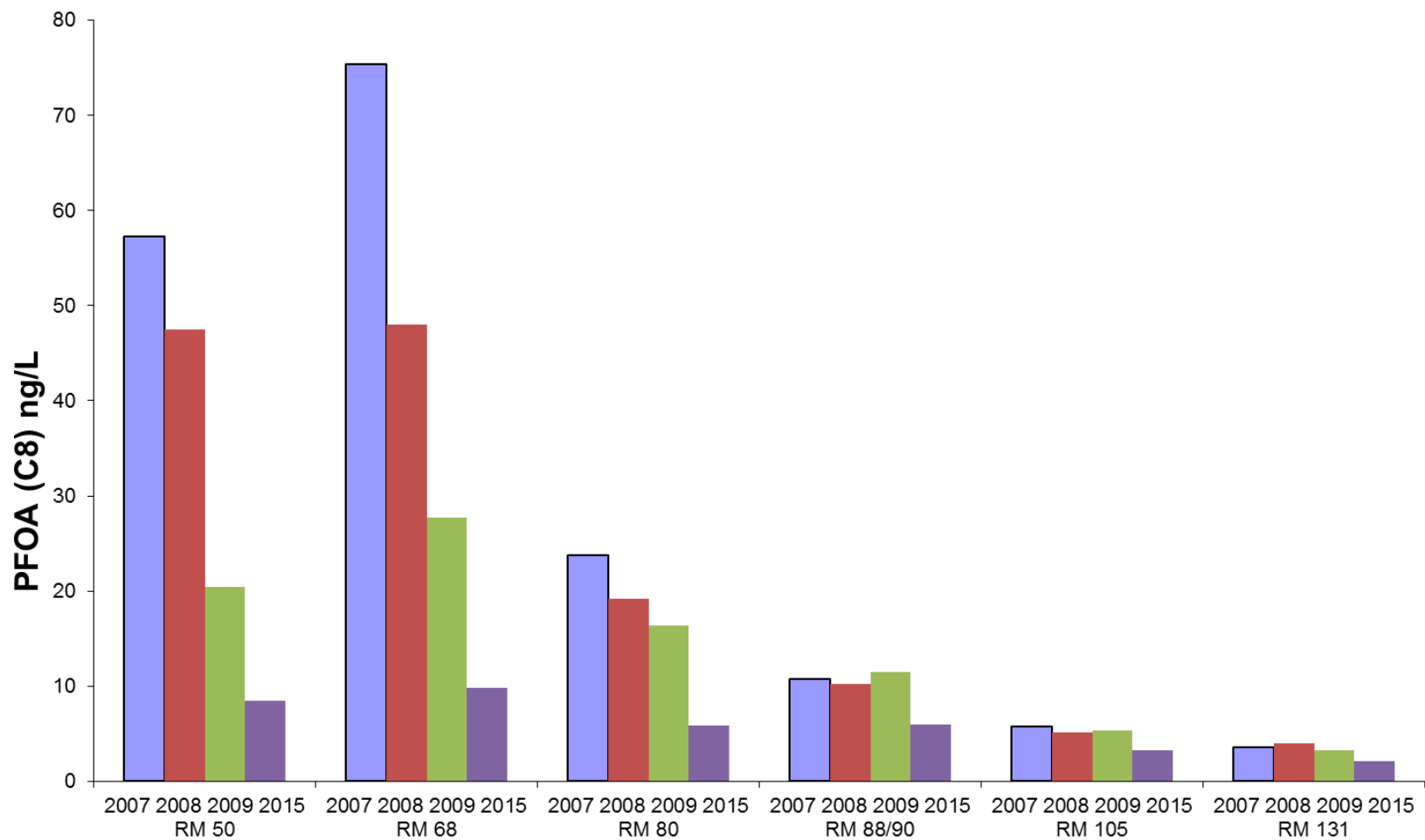
Six sites in 2007, 2008, 2009  
Fifteen sites in 2015



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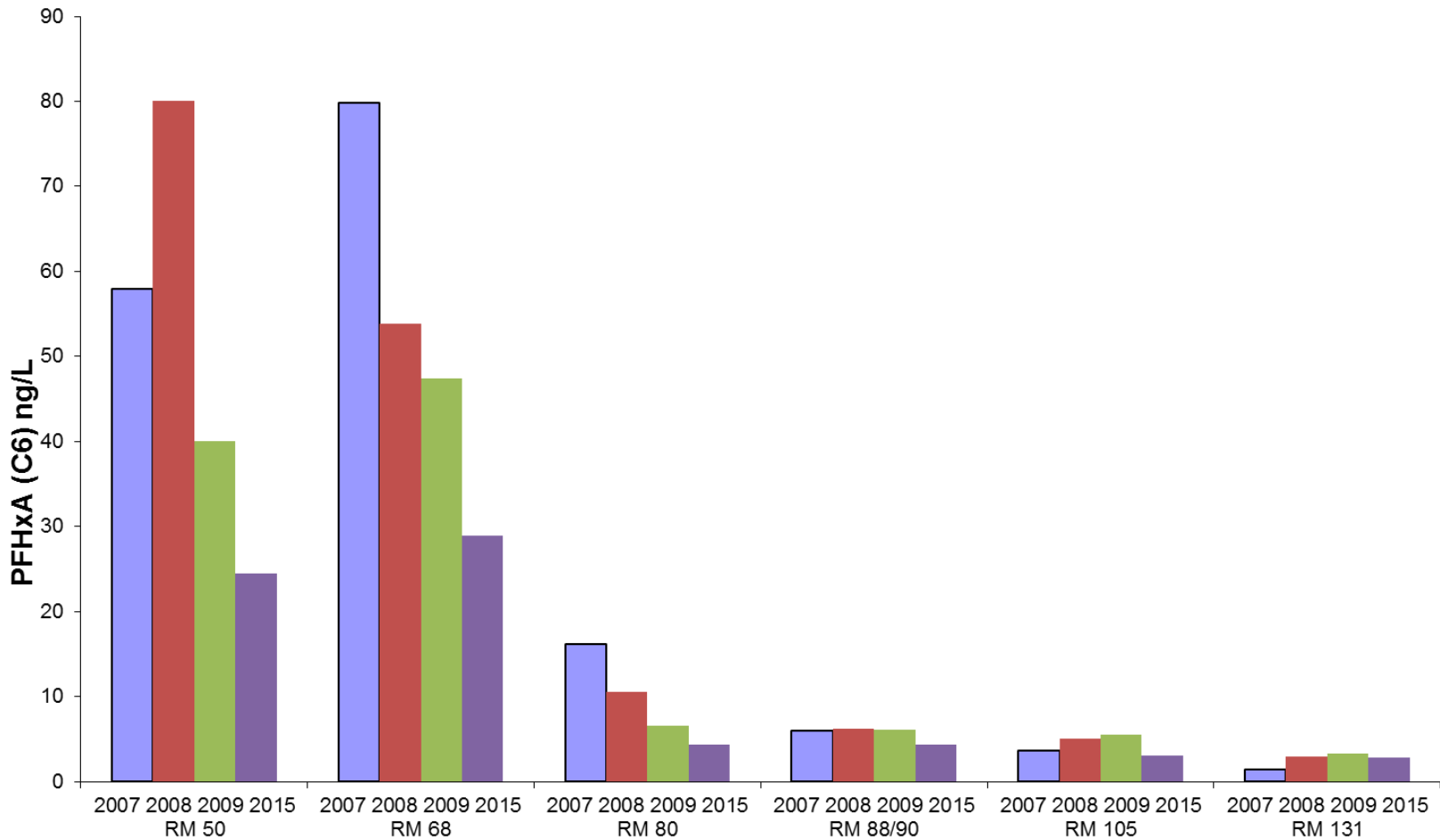
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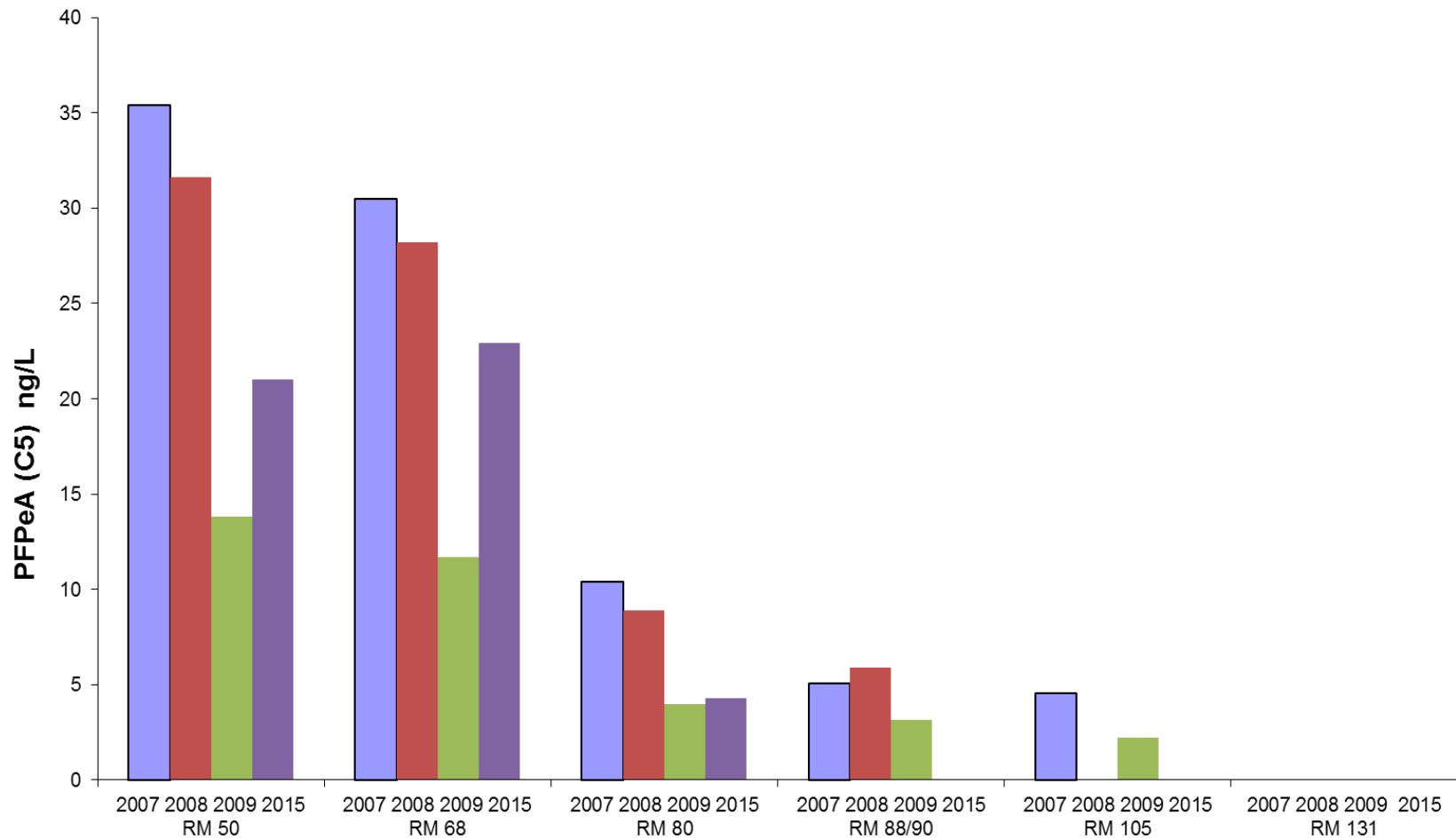
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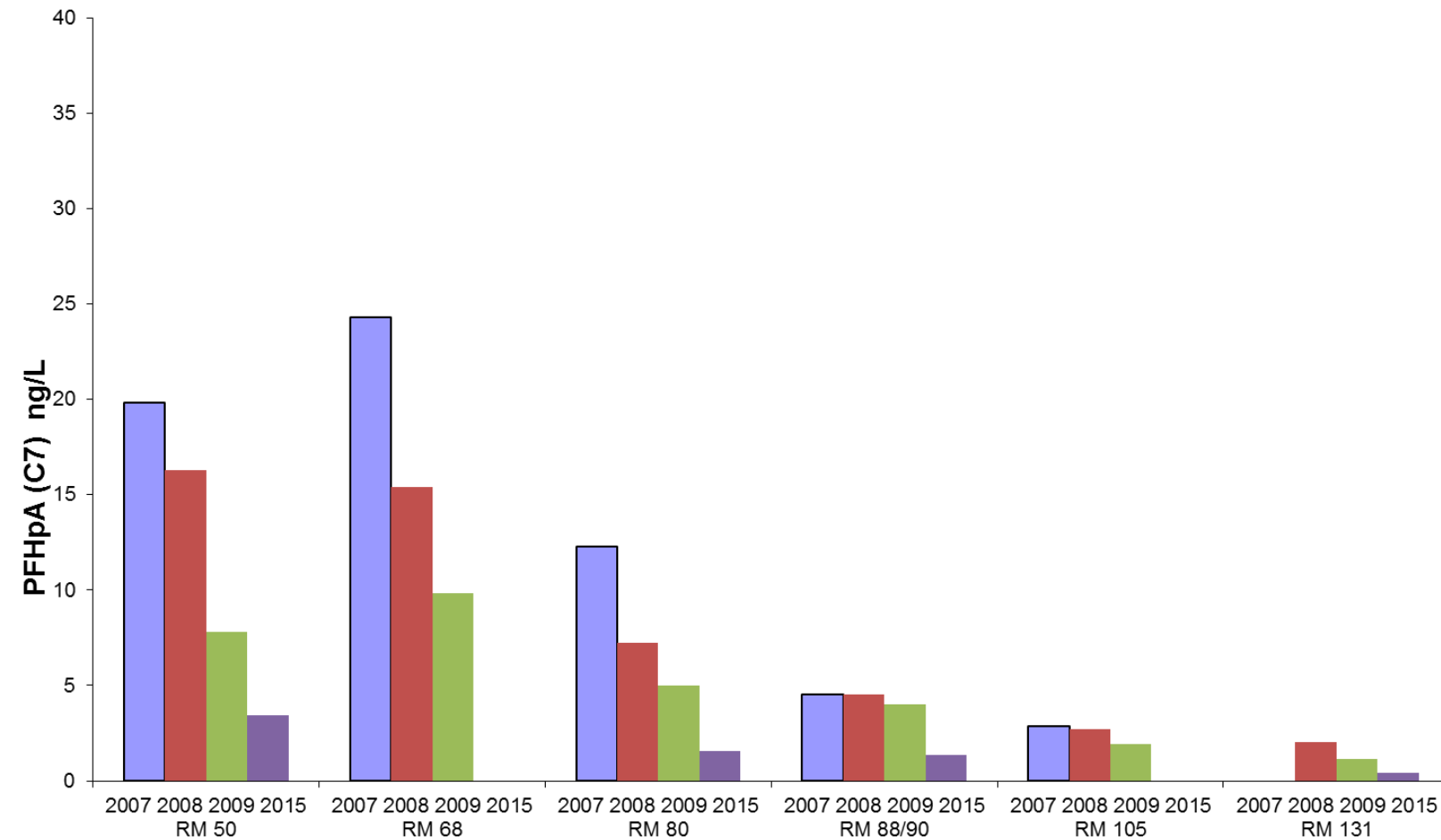
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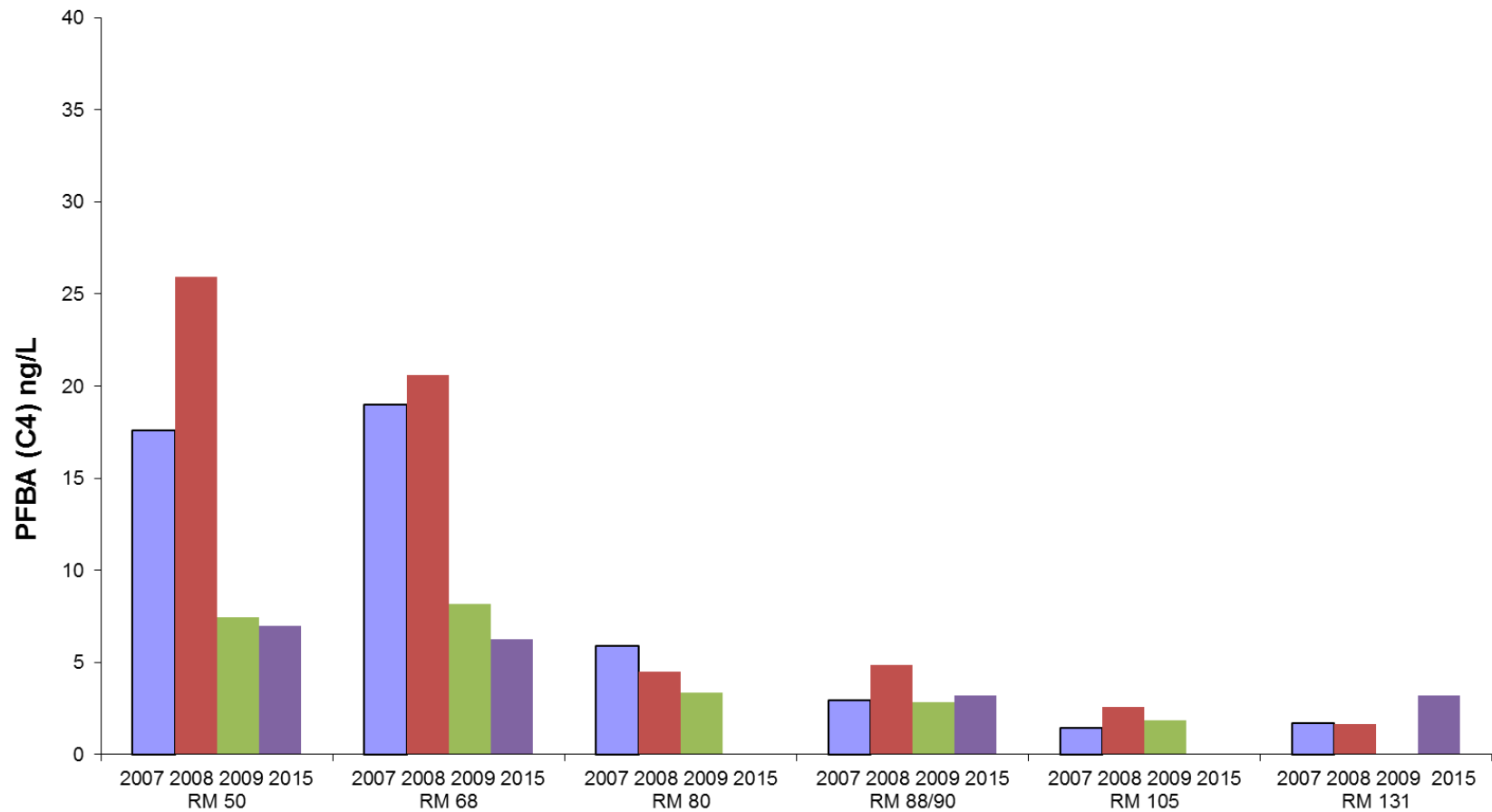
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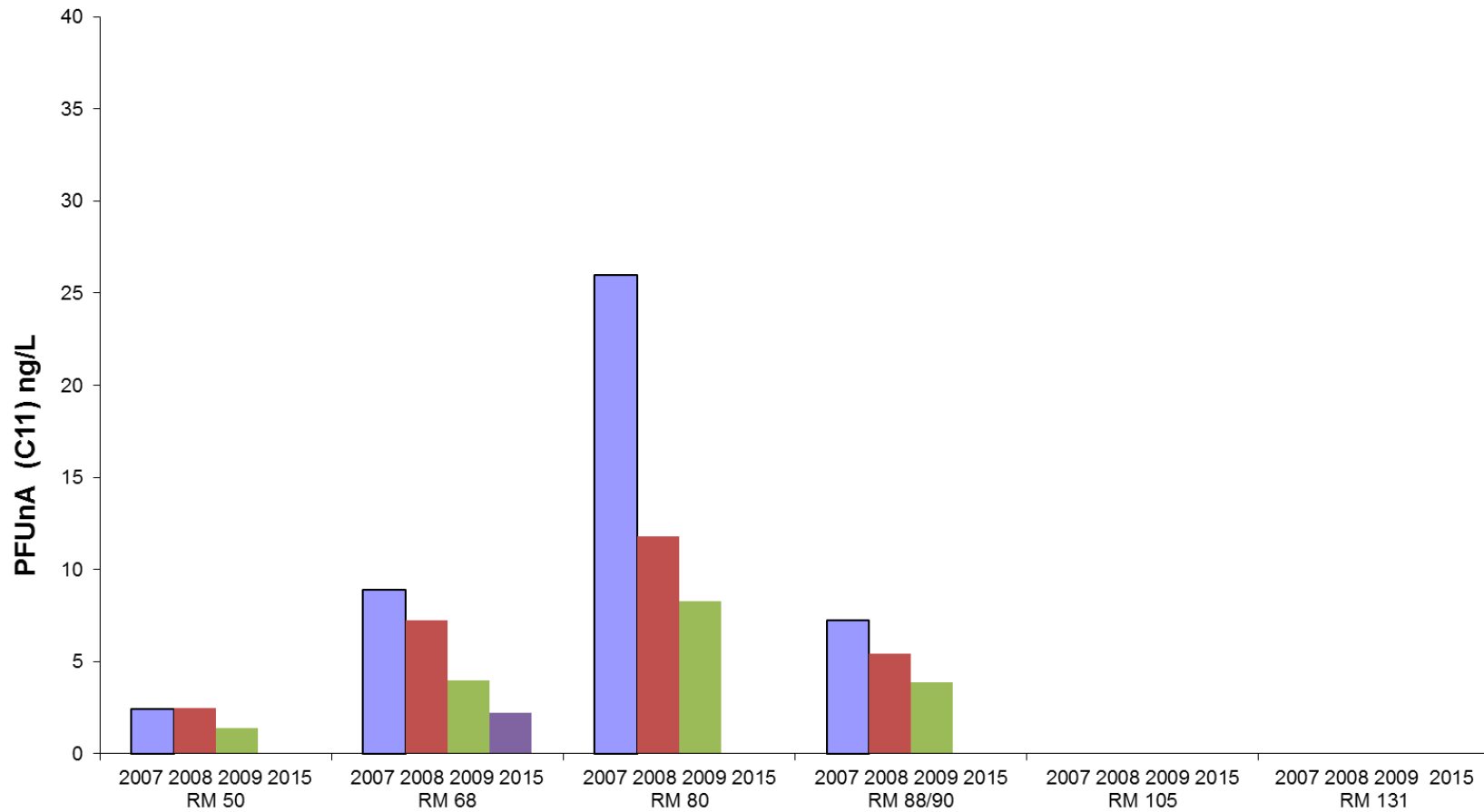
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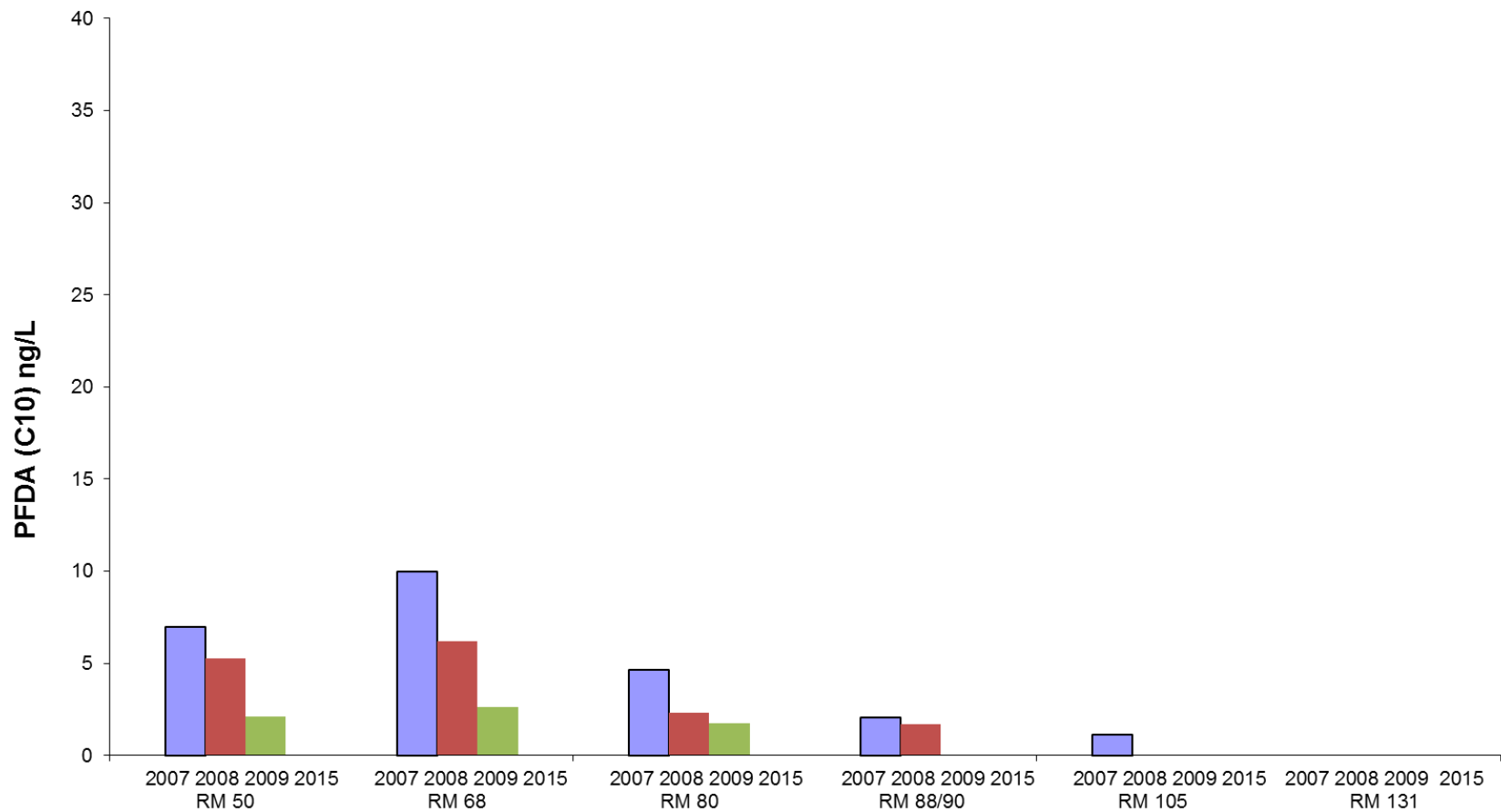
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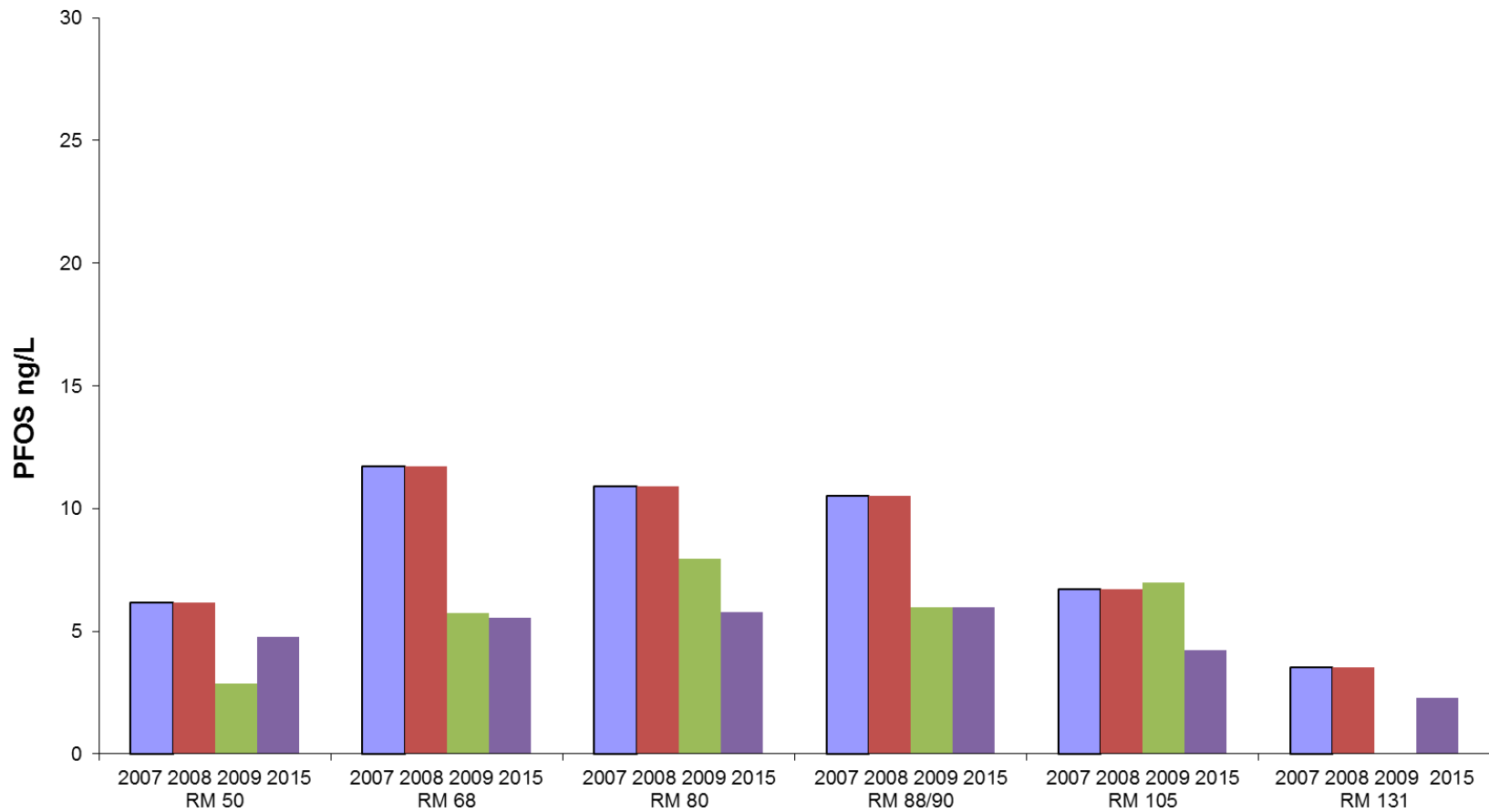
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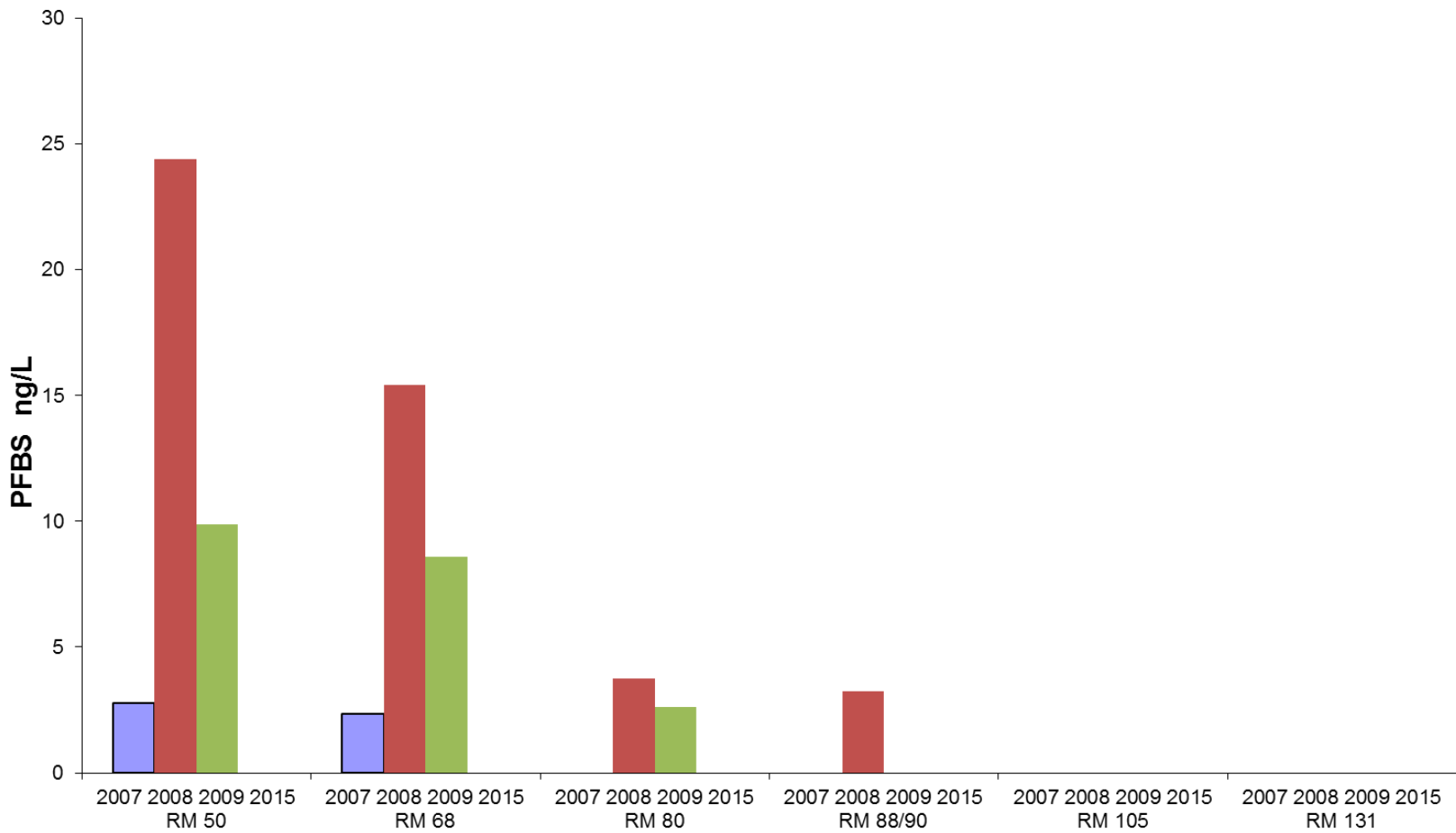
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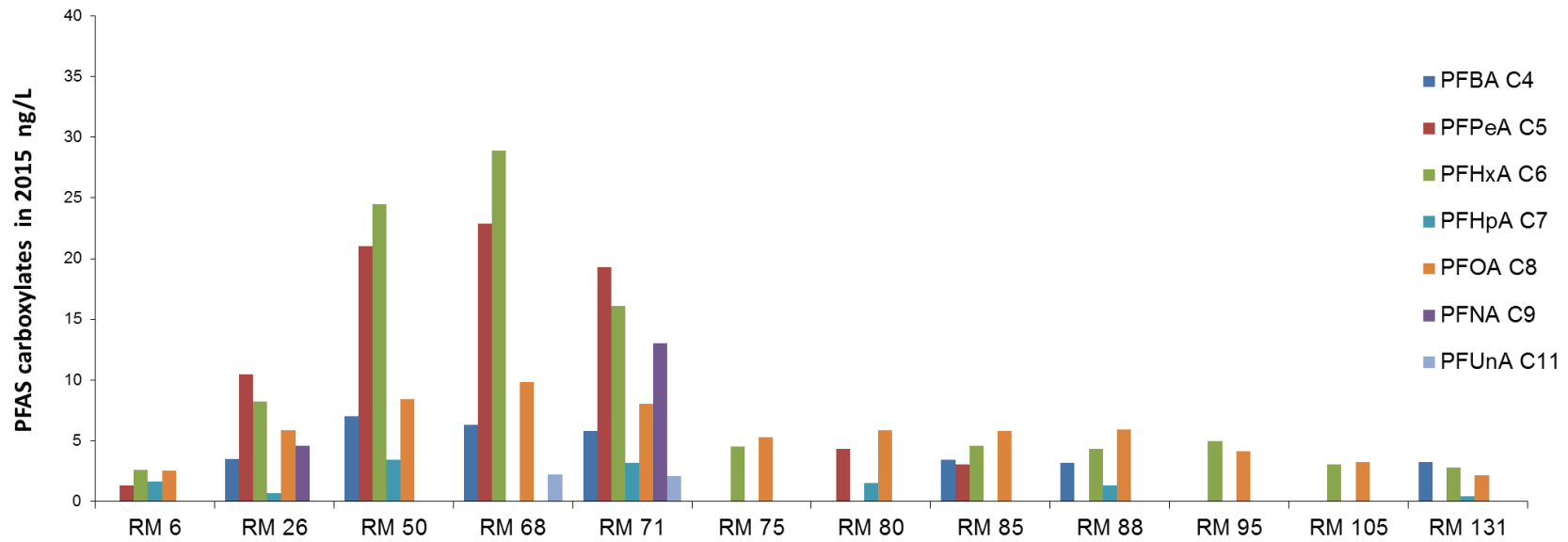
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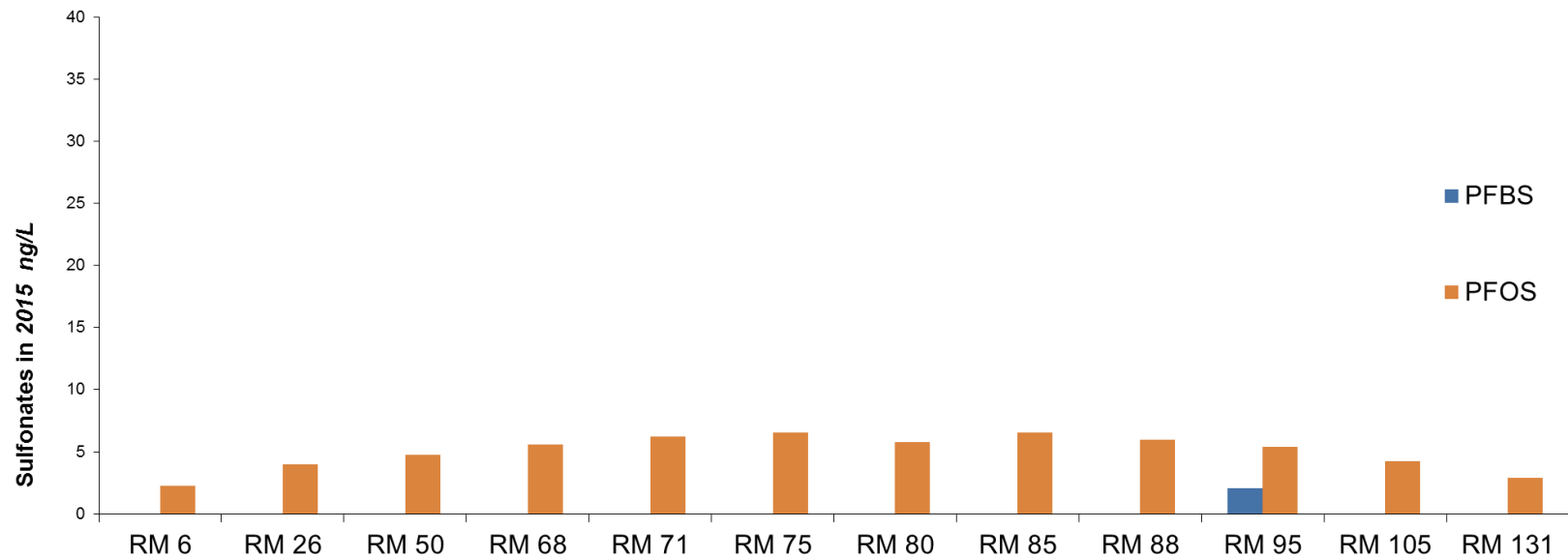
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	Delaware River 2015 occurrence max ng/L	FOD 2015 % of 15 sites	EPA ng/L provisional short term DW health advisory	NJ/DWQI ng/L GW/DW	MDH ng/L HRL in DW	Wilhelm et al, 2010 ng/L P - HRIV DW	Moermond <i>et al</i> , 2010 ng/L proposed aquatic + fish cons.	Hoke <i>et al</i> , 2015 ng/L PNEC aquatic life
PFBA C4	6.28	47			7,000	7,000		
PFPeA C5	22.9	60				3,000		
PFHxA C6	28.9	93				1,000		199,000
PFHpA C7	3.76	53				300		
PFOA C8	9.86	100	400	40	300			1,250,000
PFNA C9	13	20		13 10				
PFDA C10	ND	0						
PFUnA C11	2.22	13						
PFOS	6.52	100	200		300		0.13 0.65 3600 7200	1,200
PFBS	[2.04 U]	0 [13]			7,000	3,000		

	Delaware River 2015 occurrence max ng/L	Nakayama et al., 2010 Miss. River Basin	Post et al, 2013 NJ surface water ng/L	Rostkowski et al., 2006 industrial area in Korea	
PFBA C4	6.28	median 2.73 90th % 27.9 max 458	ND		
PFPeA C5	22.9	median 0.71 90th % 6.03 max 31.5	ND to 15		
PFHxA C6	28.9	median 1.59 90th % 7.07 max 53.4	ND to 17	0.77 to 27	
PFHpA C7	3.76	median 2.16 90th % 6.91 max 90.2		ND to 10	

	Delaware River 2015 occurrence max ng/L	Nakayama et al., 2010 Miss. River Basin	Sinclair et al, 2006 Hudson River ng/L	Post et al, 2013 NJ surface water ng/L	D’eon et al 2009 Canada surface water ng/L	Konwick et al, 2008 Altamaha River GA ng/L
PFOA C8	9.86	median 2.07 90th % 11.9 max 125	22 to 173  median 35	ND to 100	ND to 87	2.6 to 3.1
PFNA C9	13	median 0.71 90th % 3.33 max 72.9		ND to 19	0.055 to 5.6	<0.6 to 0.6
PFDA C10	ND	median 0.71 90th % 1.30 max 42		ND	0.016 to 5.1	<0.1 to 0.14
PFUnA C11	2.22	median 0.71 90th % 0.71 max 29.1			ND to 1.6	

	Delaware River 2015 occurrence max ng/L	Nakayama et al., 2010 Miss. River Basin	Sinclair et al, 2006 Hudson River ng/L	Post et al, 2013 NJ surface water ng/L	D’eon et al 2009 Canada surface water ng/L	Konwick et al, 2008 Altamaha River, GA ng/L
PFBS	[2.04 U]	median 0.71 90th % 4.21 max 84.1				
PFOS	6.52	median 3.01 90th % 17.0 max 245	median 1.7 1.5 to 3.4	ND to 43	ND to 40	2.3 to 2.9

# Summary of PFCs in Surface Waters of Delaware Estuary

- \* Longer chain
  - \* C11, C10, C9, and C8 decreasing
  - \* PFOS not decreasing, FOD in 2015 100%
  - \* PFOSA not detected > 1 ng/L any year in water
  - \* PFHxS not detected in 2015
- \* Shorter chain
  - \* C7 decreasing
  - \* C6 and C5 highest PFC in 2015
  - \* C4 decreasing
  - \* PFBS decreasing
- \* Need for more assessment values : aquatic life and HH
- \* Comparison of PFCs in other surface waters indicate local sources in Delaware Estuary

# Next Steps

Surface Water – continue water quality assessment

Fish – compare tidal and non-tidal 2015 data (when available)  
to 2004, 2005, 2006, 2007, 2010, 2012 data

Sediment – 2016 sampling